THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

Volume 15 JULY, 1936 Number 7

Photograph by H. W. Baque

This remarkable block of cullet containing wollastonite crystals was found in a Pittsburgh antique shop five years ago by H. W. Baque, Louisville, Ky. It had served as a door stop at the antique shop for several years and the proprietor was delighted to get rid of it, being "tired of looking at it."

Considered one of the finest specimens ever found, the block in the view shown above is approximately 3½ by 5½ inches. The size of the wollastonite crystals may be judged by referring to the illustration which reproduces the original block in its actual size.

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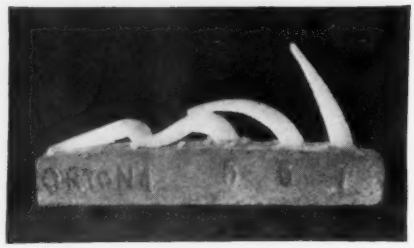

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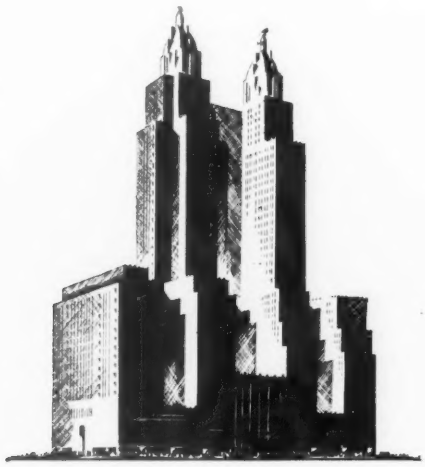

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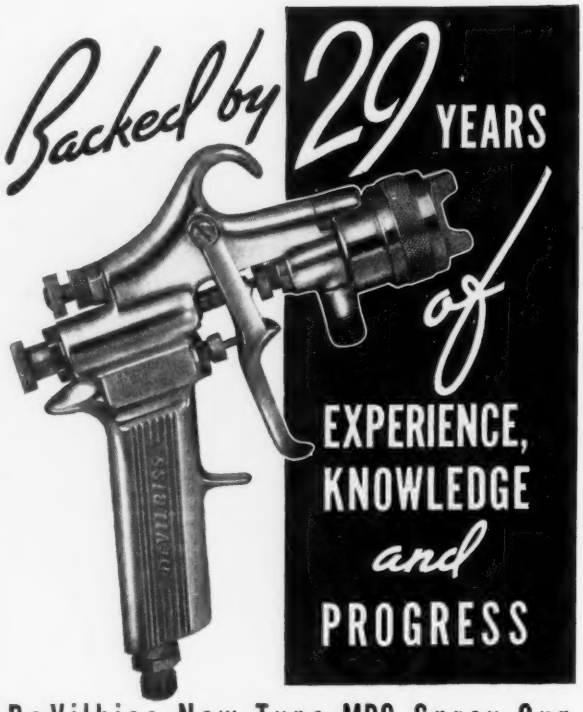

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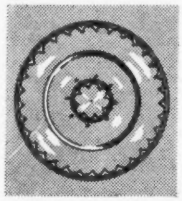

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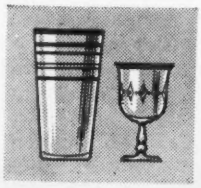

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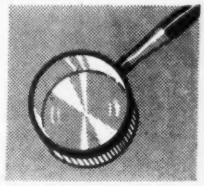

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PAPERS

THE STRENGTH OF FLAT GLASS UNDER UNIFORM LOAD*

By George B. Watkins and Roy W. Wampler

Editor's Note: This is the first of a series of papers which were presented at the Summer Meeting of the Glass Division at Hammondsport, N. Y., September 13 and 15, 1935. Other papers presented at this Meeting will be published in following issues of *The Bulletin* or the *Journal*.

Abstract

Strength tests have been conducted on flat glasses in thicknesses varying from $^1/_{10}$ to $^1/_4$ inch in both square and rectangular shapes by uniform loading (hydraulic). Data thus obtained may serve as a guide for determining the proper size and thickness of glass when used structurally.

I. Introduction

In order to determine the size and thickness of glass required to support a uniformly distributed load, such as installations in aquaria, submarine equipment, sight gages in boilers, as well as windows in gondolas for stratosphere flights and for airplanes traveling at high speeds, etc., measurements of the strength of glass in different sizes, shapes, and thicknesses have been made by subjecting the glass to uniform loading, such as hydraulic pressure. Furthermore, since the majority of these installations require the glazing to be sealed against a positive working pressure, the strength data were obtained under these conditions.

(1) Literature Review

A survey of the literature shows a very small amount of practical data available on this subject. Bodenbender[1] reports values obtained by break-testing circular disks of plate and safety glass. These values are limited to a particular size and shape of glass, namely, disks 10.24 inches (26 cm.) in diameter. Guyer[2] determined the strength of different kinds of glass; *e.g.*, wire, ribbed wire, checkered plate, etc., using 14- by 20-inch samples and not rigidly clamping the light of glass. Hepburn,[3] using the general strength formula for square and rectangular plates, gives the relative strengths of squares and rectangles of equal area. Dufton[4] supplies nomographic and alignment charts for the strength of glass which are based upon the same type of formula used by Hepburn. Glass as a structural material is discussed from the theoretical standpoint by Preston.[5] In one section of his paper, the strength of window panes of flat glass is treated, formulas being given for the maximum fiber stress when the pane is supported on all edges and subjected to uniform load, such as a snow load or a high velocity wind. In earlier papers by Preston that appeared in the same *Journal*, the strength of glass is discussed from the standpoint of the propagation of cracks, the appearance of the fissure, and its direction of travel.

* Received January 30, 1936.

[1] H. G. Bodenbender, Sicherheitsglass, pp. 206 and 236, 1933; *Ceram. Abs.*, **12** [10–11] 364 (1933).

[2] E. M. Guyer, "Mechanical Properties of Rolled and Polished Glass," *Jour. Amer. Ceram. Soc.*, **13** [9] 628 (1930).

[3] J. R. I. Hepburn, Glass as a Structural Material, pp. 9–17. Published by the Vitrea Drawn Sheet Glass Co. Ltd., London.

[4] A. F. Dufton, "The Graphic Computation of the Strength of Windows," *Phil. Mag.*, **18** [7] 792–95 (1934).

[5] F. W. Preston, "Glass as a Structural and Stress-Resisting Material," *Jour. Amer. Ceram. Soc.*, **16** [4] 163 (1933).

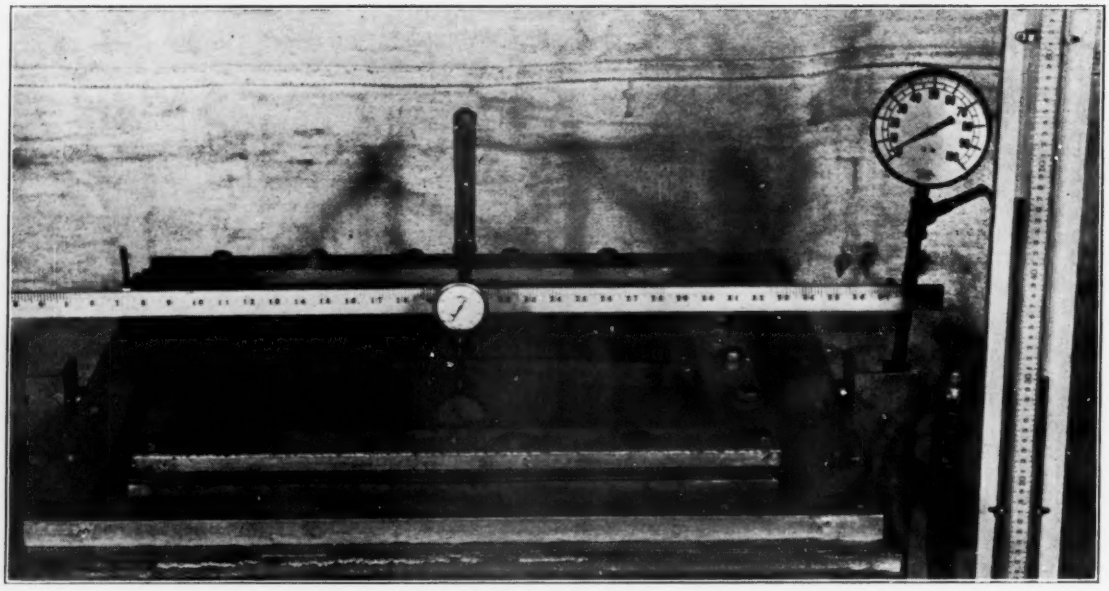

FIG. 1.—Break-testing apparatus.

II. Scope of Test

The preliminary work included the break-testing of flat glass in 12-, 18-, and 24-inch squares, and 12- by 16-inch, 12- by 20-inch, and 12- by 24-inch rectangles. Both plate and sheet glass were used and the thickness of glass varied from approximately $^1/_{10}$ to $^1/_4$ inch. Care was taken in selecting glass for these tests that showed practically no strain when viewed with polarized light.

III. Apparatus Used

The apparatus used for break-testing the glass samples is shown in Fig. 1. It was constructed by bolting a frame 1 inch thick and 2 inches wide onto a solid base of 1-inch boiler plate. The glass, which was gasketed with $^1/_8$-inch rubber, was placed on this frame, and a second similar frame was placed on the glass and bolted to the first, thus holding the glass securely in position and forming a water-tight compartment in which the glass served as one side. The inside dimensions of the frames corresponded to the glass sizes previously mentioned; the actual size of the glass, however, was such as to give a 1-inch margin which was held rigidly between the retaining frames.

Pressure was applied to the glass by means of a connection to the water main through an opening in the bottom steel bed plate, auxiliary connections being supplied to a mercury manometer and dial gage so that the breaking pressure of the glass could be accurately determined. In admitting water to the compartment, the air was vented by means of a valve introduced through the bottom of the bed plate, care being taken that all air was removed from the compartment before any positive pressure was allowed to build up. Deflection measurements were made at the time of glass breakage by means of an Ames dial gage which rested on the center of the top surface of the glass.

IV. Results

The results of break tests of the different sizes and shapes of glass with thicknesses varying from approximately $^1/_{10}$ to $^1/_4$ inch are shown in Fig. 2. The results of all break tests were recorded, and a smooth curve was drawn through the points to represent the average breaking strength of the glass plates in the different thicknesses.

Figure 2 represents a consolidation of the curves and illustrates the average pressure in pounds per square inch required to break glass of the different sizes and thicknesses. Each curve has been extrapolated to the point represented by zero thickness where the breaking pressure would be zero.

Table I records the pressure in pounds per square inch, as determined from the curves in Fig. 2, required to break glass in the different commercial thicknesses for each of the six sizes tested.

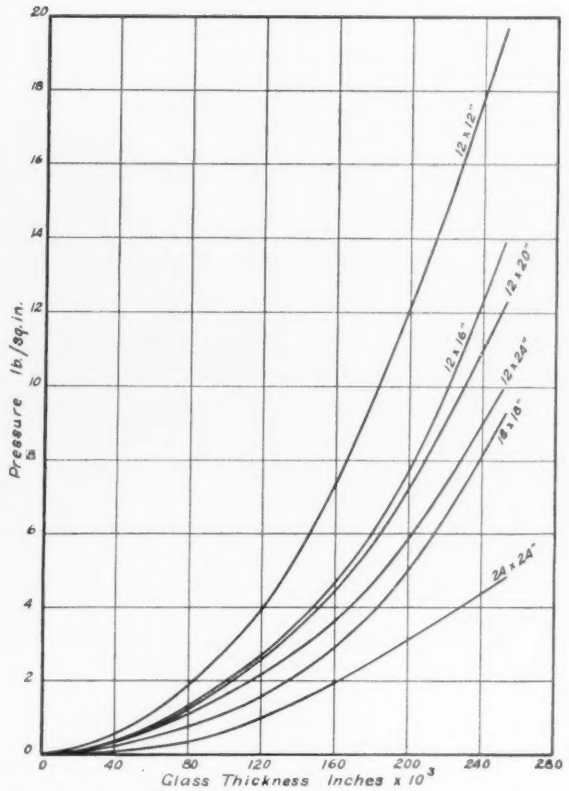

FIG. 2.—Average pressures required to break glass of different sizes and thicknesses.

TABLE I

Pressure required to break glass of dimensions given below (lb./sq. in.)

Thickness (in.)	12 x 12 in.	18 x 18 in.	24 x 24 in.	12 x 16 in.	12 x 20 in.	12 x 24 in.
0.055	0.95	0.4	0.1+	0.6+	0.6	0.5+
.065	1.3	0.5	0.2	0.9−	0.8+	0.7+
.095	2.6	1.0	0.5	1.8	1.7	1.5
.125	4.2	1.7	1.1	2.9	2.8	2.3
.187	10.4	4.2	2.7	6.5	6.1	5.0
.250	19.3	9.0	4.7	13.6	11.9	9.8

The average deflections in inches obtained just at the time of fracture are recorded in Table II for each size and thickness of glass tested.

V. Discussion of Results

Inspection of the data recorded in Table I shows that within the range of dimensions of

TABLE II

Deflection for glass of the following sizes (in.)

Thickness (in.)	12x12 in.	18x18 in.	24x24 in.	12x16 in.	12x20 in.	12x24 in.
0.093	0.134	0.162	0.161	0.114	0.138	0.165
.125	.108	.151	.184	.150	.113	.163
.198	.110	.219	.245	.111	.113	.101
.240	.115	.191	.256	.092	.113	.123

rectangles tested the smaller dimension of the rectangle is not the determining factor of the strength of the glass.

Consider the equation for rectangular plates,

$$S = K \frac{a^2 b^2}{2(a^2 + b^2)} \cdot \frac{p}{t^2}.$$

Where S = maximum stress in lb./sq. in.
a and b = width and length of plate.
p = breaking pressure in lb./sq. in.
t = thickness of plate.
K = a constant dependent upon the nature of the material forming the plate.

If a value of 6000 lb./sq. in. is assumed for S and the experimental values of a, b, t, and p are substituted in the equation, K may be determined. Using thicknesses of 0.100, 0.150, and 0.200 inch, the average value of K was found to be 0.61, 0.63, and 0.59, respectively, for the 12-, 18-, and 24-inch squares and 0.67, 0.63, and 0.66, respectively, for the 12- by 16-inch, 12- by 20-inch, and 12- by 24-inch rectangles.

Whether or not the equation is applicable to the strength tests as described, it is observed that the values of K for the different sizes of squares and rectangles are reasonably constant, especially if considered in view of the wide variation in experimentally determined values of the strength of glass. If a factor of safety commensurate with the particular glass installation is used in specifying the dimensions of the glass necessary to withstand a certain pressure, the above formula, using a value of 0.6 for K and 6000 lb./sq. in. for the maximum stress, may be used with safety.

RESEARCH DEPARTMENT
LIBBEY-OWENS-FORD GLASS COMPANY
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THERMAL ENDURANCE OF DIFFERENT TYPES OF FLAT GLASS IN RELATION TO THICKNESS*

By Roy W. Wampler and George B. Watkins

Abstract

Thermal-shock tests have been conducted on three-inch squares of different types and thicknesses of flat glass by quenching samples in water at 32°F from a predetermined elevated temperature. When a graph is plotted of the temperature difference required to produce fracture against the product of the coefficient of expansion and the thickness, the points fall on a smooth curve.

From time to time the question arises as to how much of a thermal shock different types and thicknesses of flat glass will withstand. In searching through the various journals, considerable information is found that deals with container glasses but very little of this information is applicable to flat glass. This is undoubtedly due to the fact that, in the past, flat glass was seldom required to withstand anything more than a gradual temperature change, but with new applications being developed for flat glass, thermal endurance becomes an important factor.

A consideration of methods of testing flat glass for thermal endurance involves several points, (1) the dimensions which the test specimen should have, and (2) the method to be used to produce the thermal shock. For our purpose the test must take on a practical aspect and, for that reason, 3- by 3-inch samples were chosen rather than rods or bars. The specimens were readily obtainable and any condition inherent in the glass as manufactured, such as strain, inhomogeneities, etc., remained exactly the same as in the product going to the ultimate user. For ordinary glass, heavier than $^3/_{16}$ inch, a water bath may be used to heat the glass, providing the lower temperature at which glass is cooled is that of melting ice. For thinner glass, either an air bath or some readily water-soluble liquid such as glycerol, ethylene glycol, or diethylene glycol may be used. From a theoretical standpoint there is some question as to what effect the film of organic liquid that remains on the glass will have on its thermal endurance when it is quenched in ice water. No difference, however, was noted between the glasses heated in air, glycerol, ethylene glycol, or diethylene glycol baths.

The tests reported here were carried out by heating the heavier glasses in water; the thinner glasses, for which a water bath would not produce a temperature differential sufficient to cause failure of the test samples, were heated either in air or

Table I

Thermal-Shock and Coefficient of Expansion Data for Different Glasses Tested

Type of glass	Av. Δt°F	Max. Δt°F	Min. Δt°F	Thickness (in.) (b)*	†$\alpha \times 10^6$	$\alpha b \times 10^7$
S. S. sheet	248	288	216	0.095	4.83	4.58
D. S. sheet	216	244	189	.126	4.83	6.08
$^1/_8$-in. plate	224	257	198	.115	4.94	5.68
$^3/_{16}$-in. plate	173	194	107	.188	4.72	8.88
$^1/_4$-in. plate	147	158	139	.222	5.02	11.15
$^3/_8$-in. plate	118	124	110	.398	4.82	19.6
$^5/_8$-in. plate	109	121	104	.606	5.23	31.66
1-in. plate	92	94	90	.991	5.00	49.55
Heat-absorbing glass No. 1	329	333	324	.103	2.67	2.75
Heat-absorbing glass No. 1	236	263	222	.226	2.67	6.04
Heat-absorbing glass No. 2	180	187	162	.145	5.56	8.06
Heat-absorbing glass No. 2	137	144	134	.241	5.56	13.4
Heat-absorbing glass No. 3	190	206	181	.104	5.32	5.54
Heat-absorbing glass No. 4	147	151	142	.255	4.74	12.10
Black structural glass No. 1	117	121	114	.385	5.23	20.12
Black structural glass No. 1	117	124	115	.344	5.23	18.00
Black structural glass No. 2	133	142	128	.305	4.56	13.9
Black structural glass No. 3	121	133	115	.350	4.87	17.05

* b = glass thickness in inches.
† α = coefficient of expansion per degree Fahrenheit.

* Received January 30, 1936.

diethylene glycol. In making the thermal-endurance test, the test samples were heated at constant temperature for a time period of five to fifteen minutes depending upon the thickness of the glass. The glass was then removed and transferred as rapidly as possible to a bath containing crushed ice and water, the cooling bath being stirred while making the test. Those samples that did not break on the first treatment

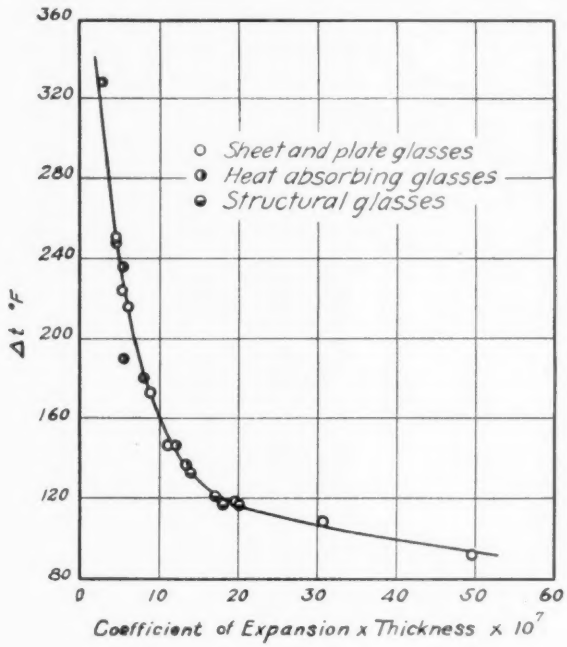

FIG. 1.

were replaced in the hot bath, and the test was repeated at a temperature one degree higher than that used in the previous trial. This procedure was followed until all of the test pieces were broken. At least ten pieces of each glass to be tested were used and over one hundred separate determinations were made on single- and double-strength glass.

Coefficient of expansion measurements were made by the quartz-tube method described by Hidnert and Sweeney,[1] using rods 3 inches long that were obtained by grinding narrow strips of the glass to an approximately circular cross-section on a roughing wheel. During the measurement, the temperature was increased at the rate of 1.8°F per minute, heat being supplied by means of an electric-tube furnace. A Pt-Pt 10% Rh thermocouple and L & N type K-2 potentiometer were used to obtain the temperature. The coefficient of expansion values recorded are for the temperature interval 68 to 662°F.

The results of the determinations on the different glasses tested are tabulated in Table I. In the first column is given the type of glass tested and in the succeeding columns, the weighted average temperature difference required to break the glass (average Δt °F), the maximum and minimum Δt, thickness of the glass, coefficient of expansion per degree Fahrenheit, and the product of the coefficient of expansion and the thickness.

The average Δt varies inversely with the thickness of the glass and the coefficient of expansion. When a graph is constructed by plotting Δt against the product of the coefficient of expansion and the thickness of the glass, the majority of the points fall on a smooth curve that resembles a hyperbola. This would mean that other factors, such as tensile strength, modulus of elasticity, and heat conductivity are approximately the same for the glasses tested or that they compensate in such a manner that the relationship shown by the curve holds true. It is rather surprising to find that the heat-absorbing glass, No. 1, falls so near to the curve since it is a borosilicate glass, whereas the regular sheet and plate glasses are soda-lime glasses. The heat-absorbing glass, No. 3, was manufactured by the cylinder process and may not have been well annealed which could account for the low value for Δt.

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[1] Peter Hidnert and W. T. Sweeney, "Thermal Expansion of Magnesium and Some of Its Alloys," *Bur. Stand. Jour. Research*, **1**, 771 (1928); R.P. 29.

WHAT THE FUTURE HOLDS FOR CERAMIC GRADUATES*

By Ross C. Purdy

Considering only the clay industries, the chart drawn by Aaron Hamilton Chute of Ohio State University[1] shows the amount of business, in terms of product values, over the span of years from 1899 to 1934. The pottery values are shown below the zero line and the structural and refractory product values are above the zero line.

It was in 1897 that the first of the Ohio State short-course students were leaving Professor Orton's classroom and laboratories, and it was in 1899 that his first four-year degree course graduate sought an opportunity in the ceramic industry. At that time it was difficult for a collegiate-trained ceramist to find employment. In the first place, the field was relatively small. In the second place, the need for technical development and supervision was not realized by the plant owners. Conditions improved slowly from 1899 until 1913, a span of two decades since Professor Orton first had started the ceramic school at Ohio State, but even in 1914 the ceramic graduates were finding it difficult to make a permanent place in the ceramic industry. There was, however, a gradually increasing realization of the need and the advantages of technical control and development.

The slowness with which the ceramic industries saw the advantage of technical control and development did not differ much from the lack of vision shown in nearly all industries. It was during this period from 1899 to 1914 that the industries, only the most advanced, such as General Electric, were beginning to see the value in technical and scientific research and to maintain research laboratories.

The World War awakened the sleeping dogs. There were four principal awakening influences: (1) increased industrial development in all lines, (2) increased and ever-increasing demand for ware that would meet with more exactness the quality specifications, (3) development of new competitive products, principally nonceramic, and (4) the economic necessity of lowering production costs while producing higher quality ware and paying higher labor wage.

These factors were effective in all industrial enterprises. Better and more efficient tool steels, better and lighter metallic construction, cheaper and more enduring metal of all sorts developed indirectly from the demands of the World War period.

Better porcelain, better refractories, and lighter weight and better tableware were demands that were stressed during the post World War period.

With the automobile there came a demand for plate glass that exceeded the production possibilities of the old cylindrical method of drawing and flattening thick glass. The sheet of glass produced had to be smoother, eliminating the need for so much grinding and polishing and thus lowering the production costs. The continuous sheet drawing of triple plate and the continuous pouring of the quadruple and thicker plates naturally followed. Puncture proof, stronger, more flexible, and actinic-ray filtering glasses were developed.

It is idle, at this time, to trace all of the economic factors that brought deep and everlasting dependence to the ceramic industrialists in technical control and development, but for the future with the ever-increasing severity in specifications and the increase in competition of nonceramic products, it seems certain that if the ceramic industries are to hold their own in competition and come back anywhere near their peak production shown in the years from 1923 to 1929, inclusive, they will have to employ many more men who have as their mental working tools the latest scientific facts and methods, and an aptitude for solving ceramic problems with these science tools.

Not only must the ceramic industries react to this situation but the universities must prepare their graduates to meet these changed and increasingly severe industrial requirements.

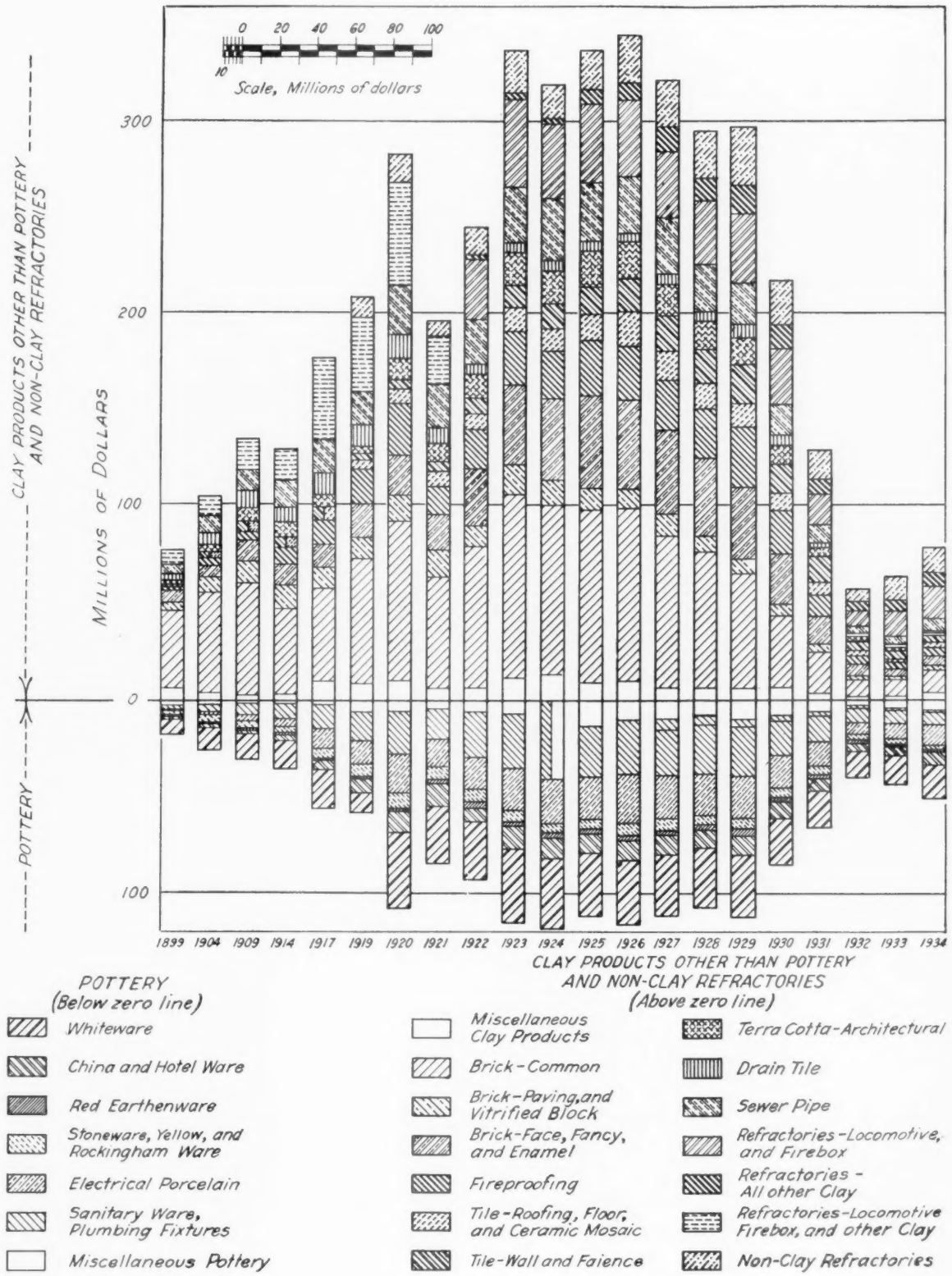
Increased Competition of School-Trained Men

In 1900, one in every ten attended high school. In 1932, five in every ten attended high school. This was an increase of five-fold in the three decades from 1900 to 1932. The attendance in the private and public high schools from 1900 to 1932 was as follows:

	1900	1932
Private high schools	100,000	400,000
Public high schools	500,000	5,140,000

* Presented at a Meeting of the Student Branch, University of Illinois, Urbana, Illinois, May 15, 1936.

[1] Doctorate thesis, Department of Commerce.


0 20 40 60 80 100
10
Scale, Millions of dollars
CLAY PRODUCTS OTHER THAN POTTERY AND NON-CLAY REFRACTORIES
MILLIONS OF DOLLARS
POTTERY
300
200
100
0
100
1899 1904 1909 1914 1917 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934
CLAY PRODUCTS OTHER THAN POTTERY AND NON-CLAY REFRACTORIES (Above zero line)
POTTERY (Below zero line)
Whiteware
China and Hotel Ware
Red Earthenware
Stoneware, Yellow, and Rockingham Ware
Electrical Porcelain
Sanitary Ware, Plumbing Fixtures
Miscellaneous Pottery
Miscellaneous Clay Products
Brick-Common
Brick-Paving, and Vitrified Block
Brick-Face, Fancy, and Enamel
Fireproofing
Tile-Roofing, Floor, and Ceramic Mosaic
Tile-Wall and Faience
Terra Cotta-Architectural
Drain Tile
Sewer Pipe
Refractories-Locomotive, and Firebox
Refractories-All other Clay
Refractories-Locomotive Firebox, and other Clay
Non-Clay Refractories

During this same three-decade period the increase in number of those who attended colleges was from 170,000 to one million.

While our population grew 66% in these three decades, the college population increased 500%.

Should the same ratio of college men to citizens have prevailed in 1932 as it did in 1900, there would have been in 1932 fewer than 300,000 in our colleges then rather than a round million. Why are more of our young people going to high school, and why is a larger percentage of them going to colleges? Is it because it is easier to do so, or is it because it is more necessary to do so? There is one conclusion, to be sure, and that is that when so large a percentage of our young people are going to high school and colleges it seems certain that if one is to equip himself to meet vocational competition he must be better educated today than were the young people in 1900.

Responsibilities of the Universities

The training and the information given to their pupils must be vastly different today than it was in 1900. The men and women graduating have a right to feel assured that they have been differently and more thoroughly prepared when graduating in 1936 than were those who were educated and prepared in 1900, or even in 1929. The Association of Ceramic Educators, recently organized, should gather all of these facts and figures to which I have only hinted. It was bad enough to have our ceramic industries lagging behind in technical development; it is much worse to have our ceramic schools lagging behind in giving to their graduates the equipment needed to find places of leadership in the industry and to aid the ceramic industry in meeting the competition of the highly developed technocracy of the non-ceramic-ware producers.

What Equipment the Ceramic Graduates Must Possess

Although the percentage is growing less, the day has not yet passed when men without formal school training can reach the top in the industry. There always will be men who, by their own perseverence and ability, will acquire the knowledge and understanding of the technology involved in satisfactorily producing the ware which they make.

There are men high in the ceramic industry, industrially and professionally well known for their scientific and technical attainments, whose schooling consisted only of occasional tutoring. Such men have progressed in the ceramic science and technology by quiet night study alone in their private laboratories and libraries and by mingling with inquisitive minds among their fellow industrial ceramists and with the scientists employed in universities, institutes, and other industries.

It is a difficult task to acquire, without a prescribed course of instruction, a sufficient knowledge of physics, chemistry, mineralogy, and physical chemistry to understand and appreciate the practical value of the most thorough-going scientific papers and addresses. That it can be done has been demonstrated by men who are today active among us. Such a difficult way of obtaining knowledge and of finding the correct application of the exact science data to ceramic-ware production would be impossible for most of us because we lack the required inspiration, energy, and perseverance; and we do not have the social adaptability and wide acquaintance by which essential contacts are made. If forced into earning a week's wage immediately after graduating from a high-school course, further intellectual advancement for most of us would be improbable.

Though one has received four years of instruction in a college in physics, chemistry, mathematics, mineralogy, and geology and has been trained in the application of these subjects to the several ceramic industrial problems, unless he has that same energy, determination, and social sense that made it possible for our high-school graduates to obtain a working knowledge of these sciences and acquire skill in their application, the college graduate will not achieve success.

To succeed in industrial ceramics, the graduate must have accomplished more than merely obtaining credits in chemistry, physics, mathematics, mineralogy, geology, and in the specialized ceramic courses. It is absolutely essential that the graduate, while in college, shall have as his foremost ambition and pleasure the ambition to acquire his professional working tools, and after graduating he must have, as his foremost duty to himself and to his family, the keeping of these tools bright and ready for immediate service by employing them in the solution of problems, even those problems which do not pertain to the job on which he, for the while, is employed.

Much, therefore, depends upon the graduate as to what place he will make for himself in the industry. He must give of himself 100% and

almost exclusively of all other things to the attainment of knowledge and proficiency in the ceramic task on which he is employed if he is to obtain a permanent and lucrative position in the ceramic industry. There is no collegiate course of study and there is no inspiring tutorship that will guarantee that the ceramic graduate will find that employment which will bring him sufficient cash remuneration to repay the cost of his college education.

(1) A healthy body, (2) the energy to accomplish an enormous amount of work, (3) completing more work of higher quality than ordinary folks can do in the same amount of time, (4) the possession of persistency, (5) the sheer determination to accomplish, sometimes called steady plugging, (6) the social sense that will bring a wide acquaintance among fellow ceramists, and (7) an unselfishness such as will prompt him to acknowledge and glory in the achievements and honors that come to his fellows, these are the virtues or qualities essential to the success of a ceramic graduate.

Where the Schools and Graduates Can Cooperate

Instructors can not train their pupils by working out their problems for them, by trying to dictate in lecture form their own digest of the literature, or by attempting to teach the elementary sciences. The student must be given ample time to acquire a broad knowledge of such sciences as physics, chemistry, mathematics, geology, and mineralogy under the tutelage of specialists in each subject. A working knowledge of these sciences by the pupil should be assumed by the ceramic instructor, and the students should simply be shown how to use these scientific tools in solving ceramic problems. Too many of our college students are forced to take all of their intellectual nutriment from the nursing bottle, whereas they should be forced to scratch for their own.

Furthermore, since the objective of a four-year ceramic engineering course is to train the graduates in the use of sciences in the production of definite ceramic products, I am a firm believer in the philosophy that ceramic studies should be pointed to the creating of new products or to the improvement of the present-day product. Terra cotta, tableware, refractories, and such products should be produced in our university laboratories where ceramic engineering is being taught, rather than slab trials which, after commencement, are thrown onto the dump.

Specialized Ceramic Education Necessary

When we consider that the last eight presidents of the American Ceramic Society either were graduates of scientific courses other than ceramics or self-schooled men, and when we consider that on the present Board of Trustees of thirteen only three are graduates with a degree in ceramics and one a graduate of a short course in ceramics, a total of four out of thirteen, and when we consider the quite large percentage of our instructors in ceramic schools and the workers in the ceramic divisions of our bureaus and research institutes who did not receive special training in ceramics, we have a right to question the value of specialized ceramic education. Yet I would not have a single doubt of the absolute necessity of collegiate ceramic schools to progress in industrial ceramics. If it had not been for the ceramic courses of instruction in our several colleges during the past few decades, industrial ceramic technology would not be on as high a plane as it is today, and our ceramic industries, I am quite certain, would be far less able to cope with the nonceramic competition with which they are faced today. It would be of tremendous advantage to the ceramic industry if, in each of those states where the ceramic industry is of industrial importance, there was a strong course not only in ceramic technology and ceramic engineering but also in ceramic art.

It is as essential that our ceramic schools shall analyze their duties and direct their energies to making our ceramic graduates most efficient as it is for our ceramic graduates to use their knowledge, their time, and their energies to achieve. Each of us must remember that we must continually readapt ourselves to changing conditions, and conditions will be continually changing. Adaptability, resourcefulness, and diligence are essential virtues.

Our minister quoted a school youngster on definitions of "education" and "knowledge"—"education is learning what others think; knowledge is having your own thinks."

ACTIVITIES OF THE SOCIETY

AMERICAN CERAMIC SOCIETY HONORS GERMAN AND JAPANESE CERAMISTS

Reinhold Rieke, Charter Member of the Deutschen Keramischen Gesellschaft and editor of the *Berichte der Deutschen Keramischen Gesellschaft*, has been elected Honorary Member of the American Ceramic Society. Seiji Kondo, Secretary of the Japanese Ceramic Association, has also been made Honorary Member of the American Ceramic Society.

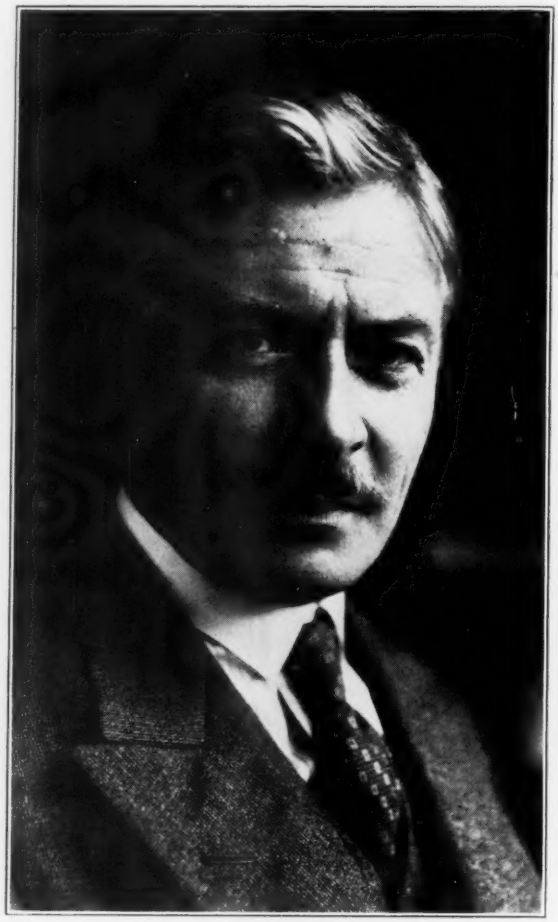
Reinhold Rieke was born in Riga on November 13, 1881, son of the imperial Russian councillor, August Rieke. In 1889 he moved to Germany where he went to school first in Höxter, i. W., then from 1891 to 1894 in Meiningen to an upper-grade high school (Realgymnasium), and from 1894 to 1900 to a classical high school (Gymnasium) in Freiburg i. B., where he graduated.

He studied chemistry from 1900 to 1901 at the University in Freiburg i. B., from 1901 to 1903 at the University of Leipzig, and from 1903 to 1904 again at Freiburg, where he received his Ph.D. in 1904.

He became assistant in the chemical-technological testing laboratory of the Royal Porcelain Factory, Berlin, where he has been director since 1921. In 1919 he became associated with the Berlin Technische Hochschule in ceramics, especially ceramic chemistry, and was appointed professor in this University after the testing laboratory he had directed had been acknowledged as a ceramic university institution for teaching.

In 1930 he received the Seger Medal from the German Ceramic Society for his promotion of ceramic science; during the same year he was made honorary member of the English Ceramic Society, and in 1935 he was made honorary member of the Czechoslovak Ceramic Society.

Dr. Rieke has treated a variety of ceramic subjects in his publications appearing in *Sprechsaal*, *Keramische Rundschau*, and *Berichte der Deutschen Keramischen Gesellschaft*, partly in association with his students. Especially known are his electric kilns with heating by coal-slag resistance and his book, Das Porzellan. He is a charter member of the German Ceramic Society, in existence since 1919, and since its inception has been editor of its *Berichte* and director of the scientific work of the Society and of his own committees.



Reinhold Rieke

MEMBERSHIP STATUS

Members Paid (Personal—Corporation)	Deferred	Subscriptions	Monthly Sales	Total Circulation
December 31, 1935 1248 187	26	488	225	2174
June 26, 1936 1332 181	43	495	200	2251

NEW MEMBERS

Corporation

CENTURY VITREOUS ENAMEL CO., W. A. Fairlie, voter, 6641 S. Narragansett Ave., Chicago, Ill.

PRECISION TRUING TOOL CO., F. J. Kroeger, voter, 515 Scott St., Cincinnati, Ohio.

Personal

BELLIDO, BARTOLOMÉ DARNÍS, Lugones, Oviedo, Spain; director, Materiales Especiales Refractarios S. A.

MYERS, MRS. ALICE C., Box 1088, Santa Fe, New Mex.; ceramic artist.

PARSONS, WILLIAM J., 1206 Maple Ave., Los Angeles, Calif.; sales engineer, Pacific Scientific Co.

Student

JORDING, HAROLD, Ohio State University.

SCHATZ, STUART, Alfred University.

TAUBER, CHARLES B., Ohio State University.

MEMBERSHIP WORKERS' RECORD

Corporation		Student	
R. B. Carothers	1		
Office	1	M. E. Holmes	1
Personal		A. S. Watts	2
T. S. Curtis	1		
W. A. Hull	1	**Grand Total**	**8**
Office	1		

ROSTER CHANGES DURING JUNE*

Personal

BAIR, GEORGE J., Mellon Institute, Pittsburgh, Pa. (State College, Pa.)

EVANS, DONALD N., Box 309, Riverside, Calif. (Monolith, Calif.)

FRANK, HENRY A., Box 4, Rayo, New Mex. (Kokomo, Ind.)

GILL, JOSEPH W., 563 Hillside Ave., Elmhurst, Ill. (Chicago, Ill.)

GUASTAVINO, RAFAEL, 143 Arvixa Ave., Bay Shore, N. Y. (Fort Lauderdale, Fla.)

HAZEN, E. J., Heilman Apts., Maple St., Kittanning, Pa. (Ford City, Pa.)

HENDERSON, H. B., Box 12, East Liverpool, Ohio. (New Brighton, Pa.)

MERWIN, BYRON W., 147 Central Ave., Fort Dodge, Iowa. (Ames, Iowa)

MIKETTA, C. A., 811 W. 7th St., 8th Floor, Los Angeles, Calif. (Beverly Hills, Calif.)

SHARTSIS, LEO, Bureau of Standards, Washington, D. C. (Riverside, Calif.)

SWEO, BENJAMIN J., Ferro Enamel Corp., 4150 E. 56th St., Cleveland, Ohio. (Washington, D. C.)

TRABERT, LOREN A., Smoot-Holman Co., Inglewood, Calif. (Evanston, Ill.)

WILLSON, B. W., 254 S. Wildwood Ave., Kankakee, Ill. (Mason City, Iowa)

* Address in parentheses is the old address.

ELEVEN COMMANDMENTS FOR SUCCESS

Essential personality traits are (1) loyalty, (2) integrity, (3) dependability, (4) diligence, (5) perseverence, (6) carefulness, (7) thoughtfulness, (8) coöperation, (9) alertness, and (10) initiative. These are integral parts of ambition. They develop personality, ability, and utility.

Success is determined by adding intelligence as the eleventh attribute. Without intelligence we can reach only limited success. Personal experience is too slow an educator.

Ceramic intelligence without cultivation is not a permanent possession. Ceramic knowledge is undergoing rapid development. Ceramists must make a constant, systematic effort to keep well informed on all new theories, processes, materials, products, equipment, literature, patents, and researches. This is necessary to maintain continuously a high degree of intelligence.

The most virile source of such information is the American Ceramic Society. The three monthly publications of this Society literally comprise the "Ceramists' Library of Knowledge." The Annual Meetings and the various Division and Sectional Meetings develop helpful contacts with other key men in ceramic industries. Leading ceramists attribute their success to the fact that they take advantage of the opportunities afforded by this coöperative educational institution. It is their intelligence service in the world-wide field of ceramics.

Advantages of membership in the American Ceramic Society are obvious. The advantages are increased with increased membership support. It is to your interest to secure more Personal and Corporation Members. Will you?

—GRANT S. DIAMOND, *Chairman*, Membership Committee

THIRTY-NINTH ANNUAL MEETING TO BE HELD MARCH 21 TO 27, 1937

Waldorf-Astoria, New York City

Plans are formulating, both for the technical programs and the entertainment of the Thirty-Ninth Annual Meeting to be held in New York, N. Y., March 21 to 27 at the Waldorf-Astoria Hotel. They promise to make this Meeting memorable.

The city, the hotel, the hosts, each of them separately provokes visions of happy, delightful, and satisfying times. Each is unusual; each is experienced; each of them is generous. Combined, the City of New York, the Waldorf-Astoria, and the Ceramic Association of New Jersey, have assured that the week of March 21 will be most satisfying.

Already the technical programs are being formulated to keep progressive their constantly increasing value from year to year.

HANDBOOK OF DATA ON VITREOUS ENAMELS PLANNED

The following outline for a handbook of data on vitreous enamels with the attached questionnaire has been sent to members of the Enamel Division. Members of the other Divisions may find the plan and details of the outline of interest, some of the topics being of value to every ceramic technologist.

1. Table of Elements, Symbols, and Atomic Weights
2. Tables of Raw Materials for Enamels
   - (*a*) Common and chemical name for substance
   - (*b*) Chemical formula
   - (*c*) Molecular weight
   - (*d*) Specific gravity
   - (*e*) Optical and crystallographic properties
   - (*f*) Hygroscopic properties
   - (*g*) Decomposition temperature, melting point, boiling point
   - (*h*) Product in an enamel melt
   - (*i*) Fusion temperature of product in melt
   - (*j*) Melted weight
   - (*k*) Factor: $\frac{\text{melted weight}}{\text{raw weight}}$
   - (*l*) Factor for each oxide left in melt: $\frac{\text{weight oxide}}{\text{raw weight}}$
   - (*m*) Color in melt
   - (*n*) Function in enamel
   - (*o*) Purity of commercial material and common impurities
   - (*p*) Percentage limits in frit and mill for different types of enamels
   - (*q*) Common percentage used in each of the types of enamels
3. Tables of Factor for Calculating Physical Properties
   - (*a*) Thermal expansion
   - (*b*) Heat conductivity
   - (*c*) Density
   - (*d*) Specific gravity
   - (*e*) Tensile strength
   - (*f*) Crushing strength
   - (*g*) Elasticity
   - (*h*) Hardness
4. Tables of Typical Compositions of Different Types of Enamels
   - (*a*) Frit batch
   - (*b*) Melted frit
   - (*c*) Mill batch
   - (*d*) Fused enamel
5. Typical Color Compositions
6. Tables of Typical Data on Enamel Slips
   - (*a*) Specific gravity of milled slips
   - (*b*) Specific gravity of slips for different methods of application
   - (*c*) Chart for changing the specific gravity of slips
   - (*d*) Solubilities of some typical enamel frits
   - (*e*) Data on fineness of typical enamel slips
   - (*f*) Typical data from pick-up test, the Gardner mobilometer, and the consistometer tests
7. Ball-Mill Data for Mills of Varying Dimensions
   - (*a*) Dimensions
   - (*b*) Volume in gallons
   - (*c*) Enamel capacity in pounds
   - (*d*) Enamel capacity in gallons of slip
   - (*e*) R.p.m.
   - (*f*) Horse power start and run
   - (*g*) Charge of pebbles in pounds
8. Table of Defects and Possible Causes
9. Rules for Design of Cast-Iron and Sheet-Steel Shapes
10. Lubricants for Shaping Sheet Steel
11. Table of Gages for Sheet Steel
12. Limits of Composition of Cast Iron and Sheet Steel for Enameling
13. Data on Sandblasting
    - (*a*) Pressure
    - (*b*) Nozzle size
    - (*c*) Cubic feet of air per minute
    - (*d*) Kilowatts per cubic foot free air per minute
    - (*e*) Horse power
14. Data on Alkali Cleansers
    - (*a*) Typical compositions of alkali cleansers
    - (*b*) Concentration of alkali-cleanser solutions
    - (*c*) Temperature of use
    - (*d*) Data for electrolytic cleaning
    - (*e*) Control data
15. Data on Pickling Acids
    - (*a*) Specific gravity concentration table for H_2SO_4 and HCl
    - (*b*) Common concentrations and temperatures for pickling solutions
    - (*c*) Data for electrolytic pickling
    - (*d*) Inhibitors and common amounts used
    - (*e*) Control data
16. Data on Cobalt and Nickel Dipping
    - (*a*) Salts used
    - (*b*) Composition, concentration, and p_H of solutions
    - (*c*) Data on control
17. Data on Neutralizing Solutions
    - (*a*) Typical compositions and concentrations
    - (*b*) Temperature of use
    - (*c*) Data on control
18. Deënameling Methods
    - (*a*) Materials used
    - (*b*) Compositions, concentrations, and temperatures used
    - (*c*) Control data
19. Typical Firing Temperatures of Enamels
20. U. S. and Tyler Standard Sieve Series
21. Temperature Conversion Tables
22. Conversion Tables for English and Metric Units of Weight and Volume
23. Comparative Heat Values of Coals, Oils, and Gases
24. Approximate Temperature by Color
25. End-Points of Pyrometric Cones
26. Temperature-Millivolt Tables for Noble and Base-Metal Thermocouples
27. Common Geometric Formulas
28. Numerical Table of Powers and Roots

Questionnaire

(1) After examining the proposed outline for a handbook of data on enamels, what items of data do you feel should be added?

What items do you feel should be omitted?

(2) Will you coöperate by contributing information in your possession that might be classified under any of the headings listed or under the headings you have suggested?

(3) If the answer to question (2) is yes, what items will you contribute and at about what date may the Committee on Data expect to receive your contribution?

Pledge

The Committee on Data promises to respect any requests a contributor may specify concerning the publication or use of the data supplied.

Please address replies to C. R. Amberg, N. Y. State College of Ceramics, Alfred, N. Y.

A REFRACTORIES MANUAL

Announcement is made by the American Refractories Institute of the appointment of A. F. Greaves-Walker as editor-in-chief of a new manual on refractories to be prepared and published under the direction of the Institute. The title of the book will be Refractories: Their Manufacture, Properties, and Uses.

FILM LIBRARY COMMITTEE WANTS ACTIVITY

President Francis C. Flint urges the coöperation of the Society members in an effort to collect a library of moving-picture films pertaining to the ceramic industries.

The object of this library, like all libraries, is fundamentally an educational one. Its value should be more far-reaching, however, in that it should facilitate teaching the public the true value of ceramic products. It would also be of value to Local Sections, Student Branches, and any educational meetings desiring information on ceramic subjects. One or two films plus a speaker would be a valuable addition to any meeting.

The value to the donor of such films will be many-fold. It will serve not only as an advertising medium but will show the high quality and high standards of production incorporated in the product.

It is planned to have the offices of the American Ceramic Society act as a clearing house from which a list of desirable and available films may be obtained and the film will be sent by the donor at the request through the Society office.

Companies having such films available should list them with the Society office and thus participate in this progressive movement. If they do not have such films at the present time, it is hoped that they may be persuaded to take this initial step.

The Committee solicits ideas on the subject.

—HAROLD E. SIMPSON, *Chairman, Committee on Film Library*

PHOTOGRAPHS AT SOCIETY HEADQUARTERS

The growing library, exhibits, and photo gallery at your Society's headquarters were shown in *The Bulletin*, pp. 205–219 (June, 1936). Those pictures were taken last March. Since then, the library, the exhibits, and the gallery have grown. Since last March, thirty-nine photographs have been received.

James Bliss Austin
Rudolf Barta
Ray Embree Birch
Frank W. Butterworth
Henry H. Blau
Robert M. Campbell
Frank Cermak
Chauncey E. Frazier
J. Earl Frazier
John L. Gallup
Frederick Heath, Jr.
A. R. Heubach
Gordon M. Hutt
Joseph A. Jeffery
George N. Jeppson
Junius F. Krehbiel
H. R. Lillie
George Vest McCauley
George D. Morris
T. N.McVay
Fred H. Norton
J. G. Phillips
R. Rieke
Otto Schott
Dale D. Schurtz
Leon Victor Solon
George H. Spencer-Strong
John W. Stipes
Wilber Stout
Birger H. Strom
John D. Sullivan
K. Takahashi
William G. Taylor
Paul Teetor
Ludwig E. Thiess
Robert Twells
Harold E. White
W. G. Whitford
J. Oatis Wilcox

It is for the purpose of having a photographic record of those who are in ceramics that this collection is being made. You will be rendering your fellow ceramists a service if you will send in a photograph of yourself, preferably one 8 × 10 inches in size for framing.

Super-Refractories through Microscope

A unique motion picture film "Super-Refractories through the Microscope" has been developed by the Research Laboratories of The Carborundum Company and is available for showing before interested technical societies.

The first part of the film was made by the kodachrome process and shows the structure of various refractory materials as they are revolved on the stage of the polarizing microscope.

The second part of the film was made by means of the newly developed thermal microscope and gives a graphic demonstration of the actual behavior of various types of refractories under severe operating conditions.

The first public showing of the film was at the Annual Meeting of the American Ceramic Society, March, 1936. The pictures are of great interest and are concrete evidence of the development of a new laboratory technique that contributes to the interests of manufacturers and consumers of refractories.

Groups wishing to show this film should communicate with the Film Library Committee, H. E. Simpson, *Chairman*, Mellon Institute, Pittsburgh, Pa.

PITTSBURGH SECTION

The Pittsburgh Section, American Ceramic Society, held its May meeting on Wednesday evening, May 13, at the College Club, Oakland, Pittsburgh, Pa. This last meeting before the summer recess took the form of a dinner and bridge party at which the ladies were guests. Forty-six persons were present.

Chairman H. B. Du Bois introduced the after-dinner speaker, Alexander Silverman. Dr. Silverman described a remarkable pseudo-investigation involving synthetic gems, bull fights in Madrid, salvaged chewing gum, and overheated pachyderms loaned by Ringling Bros. circus. There was also an exhibition of some of the purported results of the research.

R. E. Birch, W. C. Rueckel, and Earl Petrie were in charge of the program for this meeting.

—DWIGHT G. BENNETT, *Secretary*

CALIFORNIA SECTION

On May 23, twenty members and their families and friends made a trip to Catalina Island and inspected the Catalina Potteries. This trip was arranged upon the invitation of Past-Chairman F. A. McCann, superintendent of the plant. Mr. McCann conducted the party through the plant and showed their operations in all details.

The visitors were then taken for a drive over Sky-Line Drive and to the world-famed bird farm. In the evening dancing was enjoyed at the Casino. Most of the party remained over for Sunday and the day was spent in fishing, playing golf, or sight-seeing.

—B. M. BURCHFIEL, *Chairman*

SUMMER MEETINGS

ART DIVISION

The Art Division of the American Ceramic Society will hold its Fall Meeting, October 30 and 31, 1936, at Baltimore, Md. Walter A. Weldon, Locke Insulator Corp., Baltimore, is Chairman of the Committee in charge. The other members of this committee are as follows: Roy G. Blunt, R. Guy Cowan, E. deF. Curtis, C. C. Engle, Edward B. Filbert, W. N. Harrison, Mrs. Mildred C. Kingsbury, T. A. Klinefelter, Thomas Ryder, Roland J. McKinney, S. M. Shelton, and Karl Türk.

Enthusiastic coöperation has been secured from the Baltimore Museum of Art (Roland J. McKinney, Director), The Walters Art Gallery (C. Morgan Marshall, Administrator), the Association of Commerce, and other groups. Special exhibits of ceramic products will be assembled by the museums and will be shown in addition to their excellent permanent collections.

The program of papers and discussion will be announced in August. The weather is agreeable in Baltimore in late October, the seafood is at its best, and there will be much to enjoy in addition to the Art Division Program and exhibits which Mr. Weldon and his Committee plan to make of great interest and value.

—L. E. BARRINGER, *Chairman*, Art Division

MATERIALS AND EQUIPMENT DIVISION

The Materials and Equipment Division of the American Ceramic Society will hold a joint meeting with the Industrial Minerals Division, American Institute of Mining and Metallurgical Engineers, Friday and Saturday, September 25 and 26, at Pennsylvania State College.

"Beneficiation of Ceramic Materials by Flotation" will be the subject of the symposium on Friday afternoon.

H. I. Smith, *Chairman*, Industrial Materials Division, A.I.M.M.E., Room 3241 Interior Building, Washington, D.C., and H. B. DuBois, *Chairman*, Materials and Equipment Division of the American Ceramic Society, East Liverpool, Ohio, are in charge.

WHITE WARES DIVISION

The White Wares Summer Meeting will be held at Hotel Bartlett, Cambridge Springs, Pa., September 18 and 19. For basis of the program of round table discussions see *The Bulletin*, **15** [3] 95 (1936), also **15** [2] 56 (1936).

W. Keith McAfee and J. W. Hepplewhite promise that this will be a very enjoyable and profitable two-day meeting. $5.00 to $5.50 a day including meals, bath and golf priveleges.

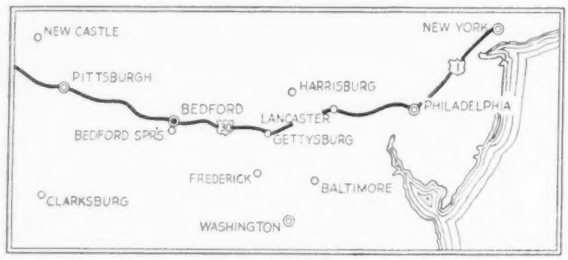
H. Ries Represents Society at Centenary Celebration

H. Ries, Cornell University, represented the American Ceramic Society at the celebration of the Centenary of the Geological Survey of Pennsylvania, June 12 and 13.

REFRACTORIES DIVISION

The Summer Meeting of the Refractories Division of the American Ceramic Society will be held September 4 and 5 at Bedford Springs Hotel, Bedford Springs, Pa. The Committee in charge of the Summer Meeting Program consists of W. C. Rueckel, *Chairman*, H. M. Kraner, and W. R. Kerr.

Bedford Springs, Pa., is located about one and one-half miles from the town of Bedford, Pa., which is on the Lincoln Highway, 99 miles east of Pittsburgh and 199 miles west of Philadelphia. A branch line of the Pennsylvania Railroad goes through Bedford Springs. This connects with the main line of the Pennsylvania Railroad at Altoona, Pa., or the main line of the Baltimore & Ohio at Cumberland. Service on the main line of the Pennsylvania is provided from Huntingdon, Pa., to Bedford.



Tentative plans call for a brief technical session on the subject of regenerators and regenerator refractories. The remainder of the time is to be devoted to entertainment.

GLASS DIVISION

Hotel Riverside, Cambridge Springs, Pa., third week in October. Reports from the International Congress on Glass. Cost $5.00 to $5.50 per day, including meals, baths, mineral waters, and golf.

Ferro Enamel Corporation Sponsors Enamel Forums in July

A Forum on Porcelain Enameling, under the auspices of the Ferro Enamel Corp., Cleveland, Ohio, will be held July 23, 24, and 25. The Forum, to be held at the Ferro plant, will discuss shop problems and process methods. Prominent members of the porcelain enameling industry will deliver lectures. J. E. Hansen is in charge of the Forum.

A special Forum for Kitchenware Enamelers will also be held on July 17 and 18. Visiting enamelers will have an opportunity to inspect the porcelain enamel building at the Great Lakes Exposition being held in Cleveland this summer. The building is all porcelain and houses a complete variety of porcelain enameling exhibits.

CERAMISTS HONORED AT UNIVERSITIES

An increasing number of members of the American Ceramic Society are receiving recognition by various colleges and universities for outstanding service in their particular field of work. A partial list of honorary degrees presented to these men in June, 1936, is given herewith.

Cullen Warren Parmelee, Doctor of Science, Rutgers University

Dr. Parmelee was presented with the degree of Doctor of Science at Rutgers University on June 13, 1936. The following tribute was paid to him at the time this degree was presented:

"Graduate of Rutgers University in the class of 1896; sometime President of the American Ceramic Society; able scientist and teacher.

"Since that day forty years ago when you received your diploma as Bachelor of Science from this institution, then Rutgers College, you have devoted your efforts to achievements in one field of professional endeavor with a singleness of purpose all too rare and have brought distinction to your Alma Mater.

"Five years after your graduation you returned to the fellowship of the campus, first as instructor in chemistry, later as professor. During this period of time you organized the Department of Ceramics and served as its first Director. Your legacy to Rutgers remains as a fitting tribute to your vision and energy.

"Subsequently you became Professor of Ceramic Engineering at the University of Illinois and Head of the Department. When, years hence, the record of your achievements is written, the emphasis will be laid not upon a galaxy of small attainments but upon a splendid measure of excellence in one field.

"As our ambassador to a great sister institution, as a scholar of distinction, and a gentleman whose modesty is characteristic, you have earned the admiring respect of your Alma Mater. It is appropriate that, with the approval of the trustees of Rutgers University, I confer upon you, *honoris causa*, the degree of Doctor of Science."

John Clyde Hostetter, Doctor of Science, Bucknell University

This degree was presented to Dr. Hostetter, Research Director of Corning Glass Works, on June 8, 1936, at Bucknell University, for his part in the production of the California Institute of Technology 200-inch glass telescope reflector.

The address made by Frank M. Simpson, Bucknell University, in presenting John C. Hostetter for the honorary degree of Doctor of Science, at Bucknell University's eighty-sixth Commencement, June, 1936, is given.

"A native of Williamsport, Pennsylvania, he received his higher education at Bucknell where he was graduated in 1908 with the degree of Bachelor of Science to be followed in 1909 by the degree of Master of Science and in 1930 by that of Chemical Engineer. After serving his Alma Mater from 1908 to 1910 as instructor in chemistry, he became Assistant Chemist of the United States Bureau of Standards. From 1912 to 1919 he was physical chemist at the Geophysical Laboratory of the Carnegie Institute. The following year, 1920, Mr. Hostetter began his association with the Corning Glass Works, filling one important position after another. At present, he is the Director of Development and Research for that Company.

"Author of many papers on scientific investigation, holder of several patents, his contributions to the advance of American science have been numerous and noteworthy. As an authority on the production and uses of glass, he has achieved world eminence as attested by his membership on the Advisory Committee of the British Society of Glass Technology. To his knowledge of his craft, to his faculty for intensive application, and to his ability for coöperative effort must be ascribed in large measure the successful production of the mighty 200-inch glass telescope recently delivered by the Corning Glass Works to the Mt. Palomar Observatory in California. In personal tribute to him and in grateful acknowledgement of his services to the cause of science, his Alma Mater recommends him for the honorary degree of Doctor of Science."

Arthur Eugene Baggs, Doctor of Humane Letters, Alfred University

Alfred University presented Dr. Baggs with the degree of Doctor of Humane Letters on June 10, 1936, during the Centennial Commencement exercises at Alfred University. Marion Fosdick, Professor of Ceramic Art, gave the following acknowledgment to Dr. Baggs' achievements in ceramic art:

"Mr. President, I take pleasure in presenting for an honorary degree a man who is widely admired for the extent of his achievement in ceramic art, and who, a son of Alfred, most worthily represents her by the spirituality and sincerity of his character.

From left to right: J. M. McKinley, A. E. Baggs, M. E. Holmes, L. V. Solon, R. C. Purdy, J. Nelson Norwood, President, Alfred University (June 9, 1936).

"The development of ceramic art has progressed since prehistoric times as a living need of humanity. In that field this man has explored and worked very patiently. He has an imagination which can create from a chance product a beautiful achievement. He has an understanding of the aesthetic, technical, and spiritual values necessary to a mature artist. By all these qualities he is recognized nationally as a master craftsman and a teacher of the high-

est caliber. In meeting him one thinks not only of the professional man but of the man who achieves spiritual as well as material beauty in his career.

"As a teacher he has spent years in Marblehead, Massachusetts, where he owns the Marblehead Potteries, in New York City at the Ethical Culture School, at the Cleveland School of Art, and since 1928 at Ohio State University where he is Professor of Ceramic Art. As a potter he has had awards in many exhibitions, has been made a master craftsman of the Boston Society of Arts and Crafts, has received the Charles Fergus Binns Medal of excellence. He has contributed written work of value to the profession. Examples of his pottery are in the permanent collections of the Metropolitan Museum of Art, in the Art Museums of Boston and Newark, and other collections of art. He is a Fellow of the American Ceramic Society.

"Mr. President, I believe that Alfred University, by conferring a degree upon this gentleman, a distinguished son whose career is of far-reaching importance in the field of ceramic art, will be herself honored. I therefore present for the honorary degree of Doctor of Humane Letters, Arthur Eugene Baggs."

Ross Coffin Purdy, Doctor of Science, Alfred University

At the One-Hundredth Convocation held at Alfred University, June 9, Ross C. Purdy, General Secretary of the American Ceramic Society, received the honorary degree of Doctor of Science. In presenting Dr. Purdy for this degree, Dean Holmes spoke as follows:

"Since the passing of the great founders of the American ceramic profession, the ceramic world has been turning more and more for leadership to the distinguished candidate whom I am presenting at this time for an honorary degree. With many others, I have disagreed with him radically about many things and doubtless disagreements will continue, but we are beginning to realize that he has been right more than half of the time. Besides, disagreement with one is not justification for withholding a long-deserved and long-deferred honor. Alfred University is honored today in this privilege of recognizing before the ceramic world his services to the ceramic cause, distinguished as they are by devotion, unselfishness, and effectiveness.

Ross C. Purdy receiving honorary degree of Doctor of Science from President J. Nelson Norwood at Centennial Convocation of Alfred University (June 9, 1936).

"He was reared in this community and educated at Syracuse University and Ohio State University. His industrial experience in directing research and superintending plant operations, combined later with university work as instructor and professor, served to give him the points of view of both the scholar and practical industrialist. This has served him well in his main life's work as General Secretary of the American Ceramic Society. In this capacity he has been the main motivating force, the real pillar of the American Ceramic Society, and has kept that organization intensely active and efficient through bad times as well as good. He has contributed over forty technical articles and bulletins to the ceramic literature. In his earliest writings he disclosed an amazingly accurate vision of what present-day ceramic research and education were destined to be. He has been prominently instrumental in the discarding of the obsolete plant engineering aspects of ceramic education and the substitution therefor of the modern scientific and technologic features. He initiated and actively promoted the movement that led to the establishment of ceramic divisions in the United States Bureau of Mines and Bureau of Standards.[1] He reorganized the American Ceramic Society on the basis of the present Divisions. Assistance of great importance was rendered in the organization of the Ohio Ceramic Industries Association and the introduction of ceramic art education at Ohio State University.

"My time, on this occasion, permits only these brief references to a few of his many outstanding services and achievements which have contributed so prominently to the present high standard of ceramic education, ceramic manufacture, and ceramic science. He has given unstintingly a full life's measure of devoted service to the ceramic cause."

Ross C. Purdy, Doctor of Ceramic Arts, Homer Laughlin China Company, March 30, 1936

This degree was issued from the Departments of Industrial Technology, Liberal Arts, and Applied Science, of the Homer Laughlin China Company, Newell, W. Va.

John Milton McKinley, Professional Degree, Ceramic Engineer, Alfred University

This degree was presented to Mr. McKinley at the Alfred Centennial Commencement on June 10, 1936. The nomination was made by S. R. Scholes, Professor of Glass Technology, whose tribute to Mr. McKinley follows:

"Mr. President, I wish to nominate for a degree a man who is preëminent in the field of ceramics, a past-president of the American Ceramic Society, the author of many valuable papers, and a leader in research. Without the aid of formal college attendance, but under the guidance of masters in the field, he has educated himself, and stands out today as one of the foremost experts on refractories in America.

"Among his more important achievements may be recited the national classification and standardization of special shapes of refractories; a large share in establishing specifications and tests for refractories; improvements in dry-press and extrusion processes, pioneer work on de-airing clay bodies, and the development of new bonding materials for fire brick.

"Avoiding 'casual memberships' in learned societies, he has worked hard in the American Ceramic Society, the American Society for Testing Materials, and the Refractories Institute, holding responsible and influential posi-

[1] "Report of the Committee on Coöperation with Federal and State Geological Surveys," *Trans. Amer. Ceram. Soc.*, **9**, 741 (1907).

tions in all three. He is a trustee of the Orton Memorial Laboratory. His advice and counsel are sought in every important, progressive movement in his special field.

"Because he is abundantly qualified, and because he has the affectionate esteem of all of us who know him, I am indeed happy to present for the degree of Ceramic Engineer, the Vice-President of the North American Refractories Company, John Milton McKinley."

Wilber Stout, Doctor of Science, Mount Union College*

Acting Dean Morgan presented Dr. Stout to President McMaster for the degree of Doctor of Science, June 16, 1936, with the following address:

"By recommendation of the Faculty and approval of the Board of Trustees of Mount Union College, you are authorized to confer the degree of Doctor of Science upon Wilber Stout, Bachelor of Engineering, Ohio State University, 1914; Ceramic Engineer, Ohio State University, 1931.

"Mr. Stout has been a school teacher in Scioto County, has served as an Industrial Chemist, as Assistant Geologist of the Ohio Geological Survey, was appointed State Geologist in 1928, and has served with distinction in this capacity since. A member of many learned societies, he is the author of many papers on geology. Capable, sincere, and a faithful servant of the State of Ohio, he has done much to focus the attention of the people of the State upon the geology of this commonwealth.

"I have the honor of presenting him to you to receive the Honorary Degree, Doctor of Science."

Other Professional Engineering Degrees

Missouri School of Mines

JAMES J. OFFUTT, May 29, 1936. Thesis: "A Treatise on the Use of Insulating Refractory Brick in Malleable Annealing Ovens."

Iowa State College

MURRAY CALVIN GAUTSCH, June 15, 1936. Thesis: "A Plant Control System for a Jobbing Sheet-Steel Enamel Plant."

Ohio State University, June 15, 1936

Ceramic Engineers

WILLIAM EDWARD CRAMER, B.Cer.E., 1920, Columbus, Ohio. Thesis: "The Application of the Car Tunnel Kiln to the Brick Industry."

EDWIN HENRY FRITZ, B.Cer.E., 1917, Derry, Pa. Thesis: "Present Practice and Developments in the Firing of Electrical Porcelain."

ALBERT CARL GERBER, B.Cer.E., 1915, Metuchen, N.J. Thesis: "The Development of a Successful Periodic Humidity Drier for Grog Ware."

FRANK RAE HENRY, M.D. (Starling Medical College), 1893, Dayton. Thesis: "A Study on Crushing of Non-Plastics in Dry Pressing."

JAMES WILSON HEPPLEWHITE, JR., B.Cer.E., 1920, Newell, W. Va. Thesis: "The Effect of ZrO_2 and TiO_2 upon the Crazing Resistance of a Typical Semivitreous Dinnerware Glaze."

ADDIS EMMET HULL, JR., B.Cer.E., 1917, Crooksville, Ohio. Thesis: "Method for Finding Cost of the Products of the Earthenware Industry."

EUGENE KENNETH KOOS, B.Cer.E., 1919, Clarksburg, W. Va. Thesis: "A Method of Supporting Vitrified China Articles During the Bisque Firing."

RUSSELL NEVIN LONG, B.Cer.E., 1918, Taylor, Ky. Thesis: "Recent Improvements in the Properties of Modern Semiporcelain Dinnerware Bodies."

HENRY ZANE SCHOFIELD, B.Cer.E., 1929, Columbus, Ohio. Thesis: "A Study of Replacement of Cornwall Stone by Talc and Feldspar in a Wall Tile Body."

HEWITT WILSON, Cer.E., 1913, Seattle, Wash. Thesis: "Kaolin and China Clay in the Pacific Northwest."

Chemical Engineers

JOHN HENRY KOENIG, B.Ch.E., 1931, Columbus, Ohio. Thesis: "Lead Frits and Fritted Glazes in the Manufacture of Whiteware."

LOUIS JACOB TROSTEL, B.Ch.E., 1918, Baltimore, Md. Thesis: "New Developments and Trends in Refractories Processes and Materials."

* See also *Bull. Amer. Ceram. Soc.*, **15** [6] 227 (1936).

NEWS OF MEMBERS

CERAMIC SOCIETY MEMBERS IN CANADA

Francis C. Flint, President of the American Ceramic Society, en route to the International Congress on Glass, England, visited Toronto the middle of June. He was entertained at the Engineer's Club, Toronto, by J. W. Akam, President of the Canadian Ceramic Society. R. J. Montgomery, A. E. R. Westman, H. F. Dingledine, Wm. McGolpin, and Gordon Keith were also present.

R. J. Montgomery, Ceramic Department, University of Toronto, has been working with the Women's Art Association in the establishment of a pottery club.

Gordon C. Keith, Secretary of the Canadian Ceramic Society, is celebrating this year his twenty-fifth year as a director of the Canadian Ceramic Society, having been first elected in 1911. He was appointed secretary in 1914. He has been a member of the Technical Education Committee continuously and was one of a board of four trustees who financed the establishment of the Ceramic Engineering course at the University of Toronto and the Ceramic Society scholarship, for which the ceramic industries coöperated generously. He is a member of the Canadian Engineering Standards Association and of the Brick Panel of that organization.

Recently a serious accident occurred in one of the Nova Scotia mines, a daring rescue being made of entombed men by mining workers. Ryland H. New, president of the

National Sewer Pipe Co. Limited, Toronto, started a fund with $1000 on behalf of the gallant rescuers and the total reached over $75,000.

The Research Committee of the Canadian Ceramic Society, under the chairmanship of Wm. C. McGolpin, has been carrying on research work in several directions. Among the subjects being covered are insulation, lightweight ceramic materials, de-airing, Canadian clays for enamels, control of temperature of plastic flow, etc. Several important studies on clay as a plasticizer in masonry mortars and other subjects have been carried on by the committee in connection with the Ceramic Division, Ottawa, Ontario, of which Howells Fréchette is chief engineer.

B. J. Sweo Joins Ferro Enamel Corporation

B. J. Sweo, formerly of the National Bureau of Standards, has joined the laboratory staff of the Ferro Enamel Corp. Mr. Sweo was graduated from the University of Washington, receiving a M.S. degree in 1929. From 1929 to May, 1936, he was associated with the Bureau of Standards, working in the Department of Commerce, Ceramics Division.

NECROLOGY

Edward A. Brockman

Edward A. Brockman died on May 22, 1936, of heart disease, at Seattle, Wash., where he had been living since his retirement in 1933 from the Ceramic Sales Division of the R. & H. Chemicals Department, E. I. du Pont de Nemours & Company

Mr. Brockman joined the Roessler & Hasslacher Chemical Company in 1912 and continued his services when that organization became a part of the du Pont Company in 1930. He operated at various times from the New York, Cleveland, and Chicago sales offices. Mr. Brockman was buried in Cincinnati, Ohio, where he was born on August 1, 1869.

CERAMIC SCHOOL NOTES

Massachusetts Institute of Technology

Five students are working on their theses this summer in preparation for the Doctor's Degree in Ceramics. Their names and the subject of their thesis are given below.

S. F. Brown, "The Constitution of Copper Red Glazes."

J. M. Cayford, "The Effect of Heat Treatment on Ceramic Bodies."

A. M. Blakely, "The Study of the Life History of a Glaze."

R. M. Palmer, "The Electrolytic Casting of Ceramic Bodies from the Slip."

H. Whittaker, "The Influence of Particle Size on the Plasticity of Clays."

R. O. Lane, who received his Master's Degree in Ceramics, is now with the Macklin Co., manufacturers of grinding wheels, in Jackson, Mich.

G. J. Bair, who received his Doctor's Degree in Ceramics in June, has accepted a position at the Mellon Institute on a fellowship to study problems related to the glass industry.

—F. H. NORTON

Illinois Clay Conference

Sixty persons attended the Clay Product Plant Operators' Conference held June 12 and 13 at the Dept. of Ceramic Engineering, University of Illinois, Urbana, Ill.

Hugo Filippi, Illinois Brick Co., Chicago, presented a paper on "The Steam Power Plant Problem in the Clay Plant." The importance of the power problem was indicated by the fact that the cost of power in the clay plant represents from 15 to 50% of the total direct cost of manufacturing. Important factors in the use of coal, oil, and gas for boiler fuel were discussed, and the necessity for careful consideration of the quality of the fuel was pointed out. Specifications of quality and properties as a basis for purchase were recommended. The equipment of the boiler plant and the source of trouble and inefficient operation were discussed in detail.

"Diesel Power in the Clay Plant" was discussed by Fred H. Schwetye, Walsh Refractories Corp., Vandalia, Mo. Operating data and cost of Diesel power were presented from their plant records.

J. O. Kraehenbuehl, Dept. Electrical Engineering, Urbana, spoke on "Electrical Efficiency and Economics in Plant Operation." The power bill was shown to include current consumption, demand charge, and an item dependent on the plant power factor. The influence of each of these items and the effects of defective equipment and inefficient operation were pointed out. Examples of plant operating data were shown by charts taken with a recording watt-meter. The value of this equipment to determine the effectiveness of equipment and use of power as a basis for improvements in operation were emphasized.

"De-Airing" was discussed by Wayne E. Barrett, Purington Paving Brick Co., Galesburg, Ill. The results of some tests with varying degrees of vacuum were presented. It was pointed out that the use of de-airing has, in some cases, the same effect on the clay as excessive pugging, and some changes in grinding may be necessary to offset this and to give better drying properties. Some modifications in auger-machine design are probably necessary in order to use de-airing effectively.

H. R. Straight, Straight Engineering Co., Adel, Iowa, on the subject of "Pugging," discussed some of the fundamental principles and the problems involved in pug-mill operation. In connection with de-airing, he showed that air can not be removed from the clay unless it is sufficiently broken up in the de-airing chamber.

This was followed by a discussion of the "Basic Principles of the Drying Operation," by R. K. Hursh, Dept. of Ceramic Engineering, Urbana. Temperature, relative humidity, and velocity of the air in the drier were shown to be controlling factors in the rate of vaporization of water

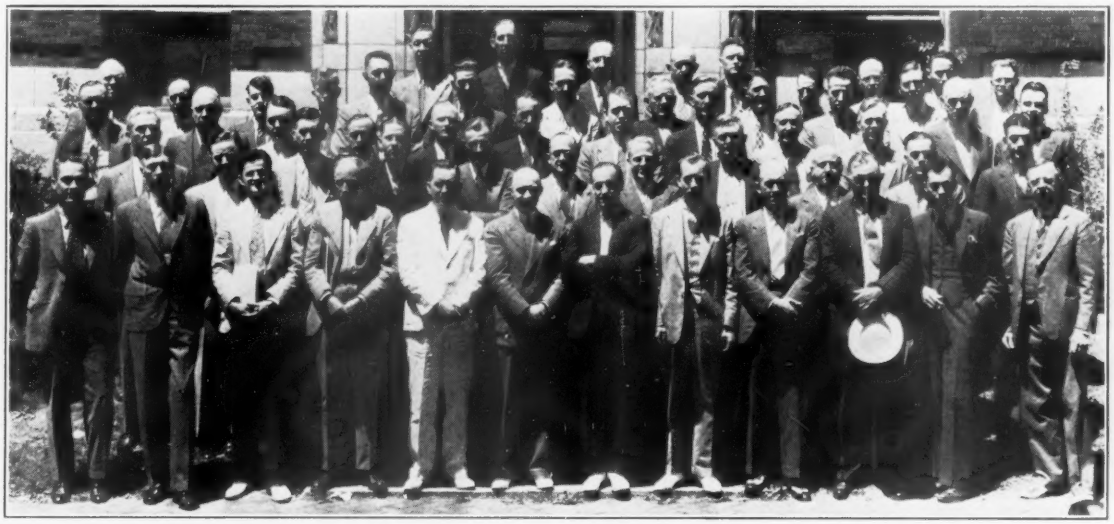
from clayware. The character of the clay body is also an important factor in the rate of drying. The amounts of air and of heat required for drying clayware were shown for driers of the direct and indirect heated types.

"Operation and Control of Driers" was the subject presented by Amos P. Potts, Clay Product Co., Brazil, Ind. It was emphasized that drying control depends primarily on the proper design of the drier. Much depends on the provisions made for regulated air movement. Automatic control of temperature and relative humidity is readily obtained if the drier is properly designed to supply heat and air where it is required. Some examples of successful types of drying equipment were discussed.

T. N. McVay, University of Alabama, spoke on "The Effect of Heat on Clays." The principles underlying the operations of water-smoking, oxidation, and vitrification were presented, and some of the factors affecting coloration of fired-clay products were discussed.

V. W. Boeker, Richards Brick Co., Edwardsville, Ill., spoke on "Methods of Firing Control." The advantage of using a fan to obtain adequate air supply for the early stages of the firing was indicated. Close control of temperature and of draft is essential to successful kiln operation. Temperature measurements in the bottom of the kiln are especially valuable to determine the progress of the firing operation and to secure suitable uniformity of heat distribution.

The program closed with a brief discussion of some records and data on "Kiln-Firing Operations" by R. K. Hursh.



Clay Conference, University of Illinois, Ceramic Department, June 12 and 13, 1936, Urbana, Ill.

Front Row: C. A. Kleymeyer, I. R. Cline, F. V. Tooley, J. M. Mamer, C. L. Archie, F. L. Steinhoff, C. E. Austin, J. W. Carty, C. T. Summers, H. E. O'Neal, H. B. Foster, Jr., R. K. Hursh.

Second Row: H. C. Kleymeyer, L. L. Cook, J. A. Slaughter, R. E. Green, T. R. Mamer, Hugo Filippi, O. P. Kossatz, J. A. Elders, O. L. Jones, O. E. Powell, C. R. Filippi.

Third Row: C. S. Finzer, Paul Green, J. F. Sommers, F. H. Schwetye, R. W. Pafford, L. A. Kimberling, W. R. Morgan, J. W. Kelly, W. C. Hoover, H. R. Straight, H. W. Bubb, H. V. Kaeppel

Fourth Row: W. A. Kurman, W. M. Ochs, C. G. Harman, R. F. Schwetye, V. W. Boeker, Clayton Smith, C. L. Thompson, John Aregood, W. E. Barrett, L. L. Ladd, J. E. Hancock, A. P. Potts, R. E. Grim, A. P. Potts, Jr., J. G. Crane.

Fifth Row: F. J. Giehler, E. B. Streater, T. N. McVay, T. L. Boys, C. U. Karnes.

UNIVERSITY ALABAMA

A.I.M.M.E. Southeast Section Meeting

A meeting of the Southeast Section of the A.I.M.M.E. was held on May 26 at the University of Alabama in conjunction with the dedication of the new Southern Experiment Station building of the United States Bureau of Mines.

J. T. MacKenzie, Chief Metallurgist of the American Cast Iron Pipe Company, spoke on "Metallurgical Research Problems of the Birmingham District," and Stewart J. Lloyd, Dean of the School of Chemistry, Metallurgy, and Ceramics, University of Alabama, on "The Extractive Industries." Brief talks were also made by E. H. Robie and Erskine Ramsey, Assistant Secretary and Director of the Institute, respectively.

At the dedicatory exercises of the new building of the U. S. Bureau of Mines, three addresses were made by the following speakers: George H. Denny, President of the University of Alabama, John W. Finch, Director of the U. S. Bureau of Mines, and Milton H. Fies, Vice-President of the DeBardeleben Coal Corporation.

The University of Alabama honored John W. Finch with the degree of Doctor of Laws and the degree of Doctor of Science was conferred on A. C. Fieldner and Milton H. Fies.—J. R. CUDWORTH, *Secretary*

The above group attended the Glass Conference held at the Department of Ceramic Engineering, University of Illinois, Urbana, Ill., June 5 and 6. Their names are as follows:

Front Row: J. M. Lange, Mark J. Terman, H. J. Shaner, J. W. Campbell, H. H. Spengler, H. H. Hanna, R. M. Hainsfurther, D. W. Dunipace, C. W. Parmelee, H. Vormelker, C. Cone, F. V. Tooley, W. B. Silverman.

Second Row: W. W. Coffeen, K. C. Lyon, J. St. Clair, G. V. McCauley, Paul Hanna, H. A. Wadman, O. P. Kossatz, G. S. Fulcher, O. G. Burch, C. L. Thompson, F. W. Schroeder, H. V. Kaeppel, A. E. Badger.

Third Row: F. L. Steinhoff, Z. C. Kline, James Arrandale, C. B. McComas, F. R. Motsch, D. D. Burress, N. C. Weil, R. W. Wampler, A. I. Andrews, T. N. McVay, W. W. Oakley, R. W. Cline.

Fourth Row: C. G. Harman, L. C. Hewitt, F. M. Johnson, A. K. Dakin, G. G. Hanson, H. C. Weller, L. W. Peterson, R. J. Rees, D. J. Carpenter, M. R. Scott, J. W. Wright, E. A. Work.

Fifth Row: L. A. Spires, Wm. Clark, J. M. McCormick, J. H. Thomas, E. C. Rees, H. A. Schreiner, J. A. Thetford.

THIRTY YEARS OF CERAMIC EDUCATION AND RESEARCH AT THE UNIVERSITY OF ILLINOIS*

An account of these thirty years of ceramic research and education at the University of Illinois can not be adequately given without citations of those who studied and worked there and without a list of the publications of the instructional staff, students, and graduates. Nor would such an account be complete without tracing the influence of the ceramic activities at Illinois on and through the Illinois Geological Survey and the science and engineering departmental work at Illinois. Such a complete account is not to be given here. Only the facilities developed and provided are mentioned here.

* See *Jour. Amer. Ceram. Soc.*, **6** [1] 97 (1923); and *The Bulletin*, **15** [6] 229 (1936).

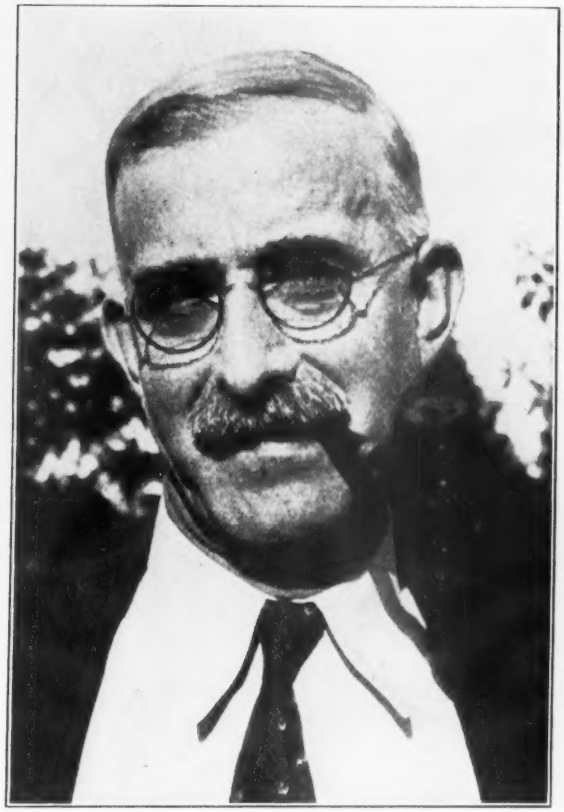
Ceramics building and kiln house (rear)

John W. Stipes

It is fitting that due acknowledgment be made of the material and the advisory aid rendered by John W. Stipes throughout these thirty years. Always generous, always helpful, and always boosting, John W. Stipes with his intimate state-wide influence has been and still is a potent factor in making ceramics at Illinois the productive institution that it is.

The influence and contributions of Ray T. Stull loom big and glow brightly in any account made of the material facilities for ceramic research and education at the University of Illinois. It was he who led the Illinois Clayworkers Association into action for state appropriations sufficient to build the magnificent and efficient Ceramic Building which now houses the Illinois Geological Survey and the Department of Ceramics. This building is a monument to the foresight, daring, and energy of Ray T. Stull.

A suitable marker should be placed on the building making known the indebtedness to Stull, Butterworth, Stipes, Gates, Hammerschmidt, and others who planned and secured the wonderful facilities at the University of Illinois for ceramic education and research.



R. T. Stull

NEW RESEARCH ASSOCIATE PLAN AT BATTELLE

Since its inception, the policy of Battelle Memorial Institute has been to combine a program of fundamental research of general interest to industry with the applied research which it has carried on for individual companies and associations under its plan of sponsored research.

A new Division of Research Associates has been established to supplement the work in fundamental science of the regular technical staff. The purpose of this new Division is to offer intensive training in practical research to the best of the younger workers in selected branches of chemistry, metallurgy, fuels, and ceramics. Appointments as Research Associate will be made for one year's duration and may be extended for a second year. A Research Associate will be expected to devote his entire time to a research problem approved by the Director and supervised by members of the Institute staff. The results of these researches will be published in order to contribute information that will be useful to science and industry.

Applications for appointment as Battelle Research Associate may be obtained from the Director, Battelle Memorial Institute, Columbus, Ohio.

WATCH YOURSELF GROW—BY GETTING MORE NEW MEMBERS

NOTES AND NEWS FOR CERAMISTS

Frank Piatt, President, American Refractories Institute

Frank Piatt, newly-elected President of the American Refractories Institute, spent thirteen years prior to his entry into the refractories industry in the usual run of work that falls to the lot of a young man trying to earn a living: clerical work, day labor in coal mines and lumber yards, and several months of day labor in a Detroit automobile plant.

Several years were spent in purchasing for three different companies. In 1923, Mr. Piatt joined the Louisville Fire Brick Works as their Ohio representative. Six years later Mr. Piatt went to Louisville, where he remained until April, 1936, when he was elected President of the American Refractories Institute.

Frank Piatt

Ohio Ceramic Industries Association

The Heavy Clay Products group elected the following officers for the ensuing year: *Chairman*, J. Leo Child, Hancock Brick & Tile Co., Findlay, Ohio, and *Vice-Chairman*, E. F. Theobald, Metropolitan Paving Brick Co., Canton, Ohio.

The Refractories Division elected the following: *Chairman*, O. E. Miller, Pyro Clay Products Co., Oak Hill, Ohio, and *Vice-Chairman*, J. M. McKinley, North American Refractories Co., Cleveland, Ohio.

The officers of the Whiteware Division are as follows: *Chairman*, R. W. Rowland, New Castle Refractories Co., New Castle, Pa., and *Vice-Chairman*, C. L. Pitcock, Crooksville China Co., Crooksville, Ohio.

Annual Meeting

The Ohio Ceramic Industries Association Annual Meeting will be held on October 9 and 10, 1936, in Columbus. Football game, October 10, Ohio State *vs.* Pittsburgh. The Association has reserved a block of tickets.

Ceramic Exhibits at Great Lakes Exposition

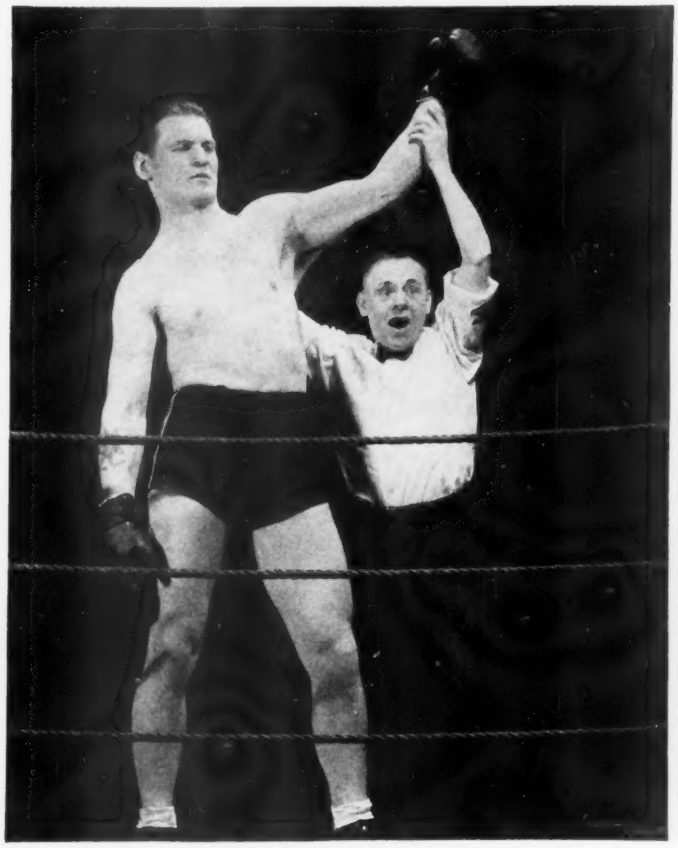
Distinguished by its colorful beauty and by its exhibition of advanced materials, the enamel building is an important focal point of interest at Cleveland's $25,000,000 Great Lakes Exposition. The building is constructed of Haskelite, which consists of pre-cut sections of plywood backed on one side by metal and on the other by porcelain enameled metal.

Displays in this building are replete with exhibits of well-known, nationally advertised products made of porcelain enamel. The important uses of enamel in industrial fields will also be shown in the exhibits.

Porcelain enameling processes will be brought home to thousands of Exposition visitors through the use of a porcelain enameling furnace where visitors may write their names on souvenirs and have them fired while they watch.

The building is being constructed by Ferro Enamel Corp. of Cleveland in coöperation with American Rolling Mill Co., Benjamin Electric Mfg. Co., Toledo Porcelain Enamel Products Co., Davidson Enamel Products Co., Erie Enameling Co., C. G. Hussey & Co., Haskelite Mfg. Co., and B. F. Drakenfeld & Co., Inc.

The following firms are listed among the exhibitors in the Hall of Progress: American Stove Co., Apex Electric Co., Bailey Walker China Co., General Electric Co., and Westinghouse Electric & Mfg. Co. In the Lakeside Exhibition Hall: American Rolling Mill, Cleveland Coöperative Stove Co., Grasselli Chemical Co., Great Lakes Steel Co., Republic Steel Corp., Timken Roller Bearing Co., W. S. Tyler Co., U. S. Steel Corp., and Youngstown Sheet & Tube Corp. The Cleveland Builders Supply Co. is exhibiting a complete building. The following firms are exhibiting in the Enamel Building: Ferro Enamel Corp., American Rolling Mills Co., Benjamin Electric & Mfg. Co., B. F. Drakenfeld & Co., Erie Enameling Co., Haskelite Mfg. Corp., Newport Rolling Mills, Otis Steel Co., Great Lakes Steel Corp., C. G. Hussey & Co., Davidson Enamel Products Co., Republic Steel Co., Sharon Steel Co., Toledo Porcelain Enamel Products Co., Youngstown Sheet & Tube Co., Youngstown Pressed Steel Co., and Pfaudler Co.



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39th Annual Meeting

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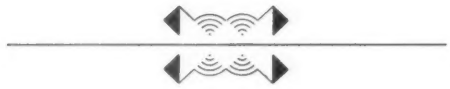
Ceramic Association of New Jersey *Hosts*



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Bone Ash
Cadmium Carbonate
Cadmium Oxide
Cadmium Sulphide
Calcspar
Chrome Oxide, Green
Clay, Vallendar
Cobalt Oxide, Black
Cobalt Sulphate
Copper Oxides
Iron Chromate
Iron Oxides
Kryolith
Lead Chromate
Magnesium Carbonate
Manganese Dioxide
Nickel Oxide, Black
Nickel Oxide, Gray
Nickel Sulphate
Potassium Bichromate
Potassium Nitrate
Potassium Permanganate
Powder Blue
Rutile, Powdered
Selenium
Sodium Aluminate
Sodium Antimonate
Sodium Bichromate
Sodium Silicate
Sodium Silico Fluoride
Sodium Uranate
Tin Oxide
Titanium Oxide
Uranium Oxide, Orange
Uranium Oxide, Yellow
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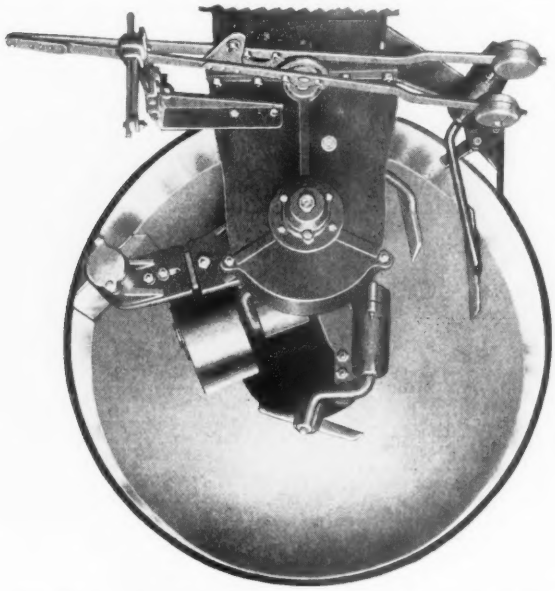
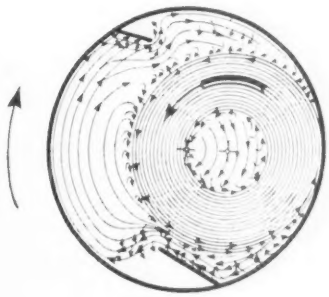


The "Lancaster" Mixer completely discharged of its mixed batch. Note the clean pan after each discharge, avoiding contamination with the next batch.

Diagram clearly illustrates the intensive mixing action.



The material in the pan is carried in a clock-wise direction at moderate velocity until it meets the proportionately fast counter-clockwise rotation of the mixing star equipment.

Countless crossing-over points are established by the relative counter currents turning the materials around its vertical axis and forcing the bottom layers to the top.

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